

ISS-2 Implementation on SAFER & MCMIS

While carrier's with SafeStat scores have their ISS-2 Inspection Value (IV) score calculated on MCMIS from ranking the overall SafeStat scores, all other carriers received an IV based on fleet size and past inspection data in SAFER. This document describes the SAFER process for applying what's called the "Insufficient Data Algorithm".

SOURCE: Applied Physics Lab, Alan Mick, 02/07/2000

If a carrier does not receive a score from the Safety algorithm, then calculate the Insufficient Data algorithm as follows (everything is based on the past 30 months):

Case 1: applies for carriers with zero (0) roadside inspections (Level I, II, III, or V). The IV value is assigned using the following table:

Category				ISS Value
1001+ power units	OR	1001+ drivers	=	100
201-1000 power units	OR	201-1000 drivers	=	99
64-200 power units	OR	72-200 drivers	=	98
16-63 power units	OR	16-71 drivers	=	97
7-15 power units	OR	6-15 drivers	=	96
2-6 power units	OR	2-5 drivers	=	95
1 power unit	OR	1 driver	=	94

Assign the carrier the higher of their values. For example, if a carrier has 75 power units (IV=98) and 50 drivers (IV=97), then their final IV score would be 98.

If there is no power unit or driver information, simply assign an IV at the midpoint value of 97.

CASE 2: Applies to carriers with some roadside inspections (levels I, II, III, or V)

Determine the carrier's Inspection per Power Unit Rate, their Inspection per Driver Rate, and subsequent Inspection Average Rate as follows and rank from 50-100.

- ☞ The Inspection per Power Unit Rate is determined by dividing the number of Level I, II, and V inspections which the carrier has had in the previous 30 months by the number of power units ¹ they indicate.
- ☞ Similarly, the Inspection per Driver Rate is determined by dividing the number of Level I, II, and III ² inspections the carrier has had in the previous 30 months by the number of drivers ³ they indicate.
- ☞ The Inspection Average Rate is then the average of these two rates (the Inspection per Power Unit rate and the Inspection per Driver rate). *If one of the rates is unable to be determined (because of no power unit or driver information or the associated Inspection Quantity is 0), the Inspection Average rate is simply which ever rate can be determined.*
- ☞ Using these Inspection Average Rates, arrange all of the carriers not receiving a Safety Score but having one or more driver or vehicle inspections and a non-zero Inspection Average Rate (A) in ascending order based on their Inspection Average Rate. Group these "n" carriers in 51 equal groupings (bins), each group having n/51 members (carriers). Assign an initial IV score of 50 to each of the n/51 carriers having the largest value of A. Assign an initial score of 51 to the next n/51 carriers having the next largest value of A. Repeat until the last n/51 (or more) carriers that have the smallest values of A are assigned a score of 100.

For the remaining discussion, the bin in which an IV score of 50 is assigned is called bin 1. The bin in which an IV score of 100 is assigned is called bin 51.

Boundary Conditions. There are 2 types of boundary conditions that require adjustments of the initially assigned IV scores:

1 SAFER uses MCMIS data element WORK-QTY-POW-UNIT (SAFER db element QUANTITY_POWER_UNITS)

2 SAFER uses MCMIS data element WORK-DRIVER-INSP-30-MTHS (SAFER db element DRIVER_INSPECTIONS_LAST30)

3 SAFER uses MCMIS data element WORK-QTY-DRVS (SAFER db element QUANTITY_DRIVERS)

Multi-bin Overlaps

In several cases, all carriers in 2 or more contiguous bins will have the same Inspection Average Rate. It is not appropriate to simply assign all carriers with the same value of A different IV scores simply because they were initially assigned to different bins. Nor should the IV score of the carriers in the first (lowest numbered) bin in the range be assigned to all members of the other bins in the range. Instead, assign IV scores as follows:

- 1) Identify the bins for which all carriers in the bins have the same value of A. Calculate the average IV score from the initial value of IV scores assigned to members of these bins. Change the IV score of all carriers in all of the bins in the range to the calculated average IV value. (If the calculated average IV score is not a whole number - i.e. the number of bins in the range is even - drop the fractional portion from the calculated average.).
- 2) Examine the bin just before the first bin in the range of bins having the same Inspection Average Rate. For example, if the bin range having the same value of A was bin "i" through "i+3", examine bin "i-1". For all carriers in bin "i-1" that have the same value of A as those in bins "i" through "i+3", change their IV score to the calculated average IV score calculated for bins "i" through "i+3".
- 3) Repeat for all other ranges of bins in which all members have the same Inspection Average Rate (A). Repeat step (2) for each range of bins found.

Single-bin Overlaps

Because carriers are assigned to bins initially by number rather than Inspection Average Rate, there will be instances in which the largest A value that is assigned to a carrier in a particular bin will also be assigned to one or more carriers in the next bin. *Therefore, carriers with the same value of A will be assigned different IV scores.* Because it is not appropriate to assign different IV scores to carriers having the same Inspection Average Rate, the boundary of the bin will have to be adjusted as follows:

- 1) Perform the multi-bin overlap adjustments described above.
- 2) Other than those bins examined in multi-bin overlap (step 2), identify the bins whose members have different values of A. For each of these bins ("i"), determine the largest value of A, say A_m . Identify all carriers in the next bin, "i+1", that have the same value of A (A_m). Change the IV

score of any carriers in bin "i+1" whose value of $A = A_m$ to the same IV score as the carriers in bin "i" whose value of $A = A_m$. This essentially changes the number of carriers in bins "i" and "i+1" but the change will not be significant.

If there is no size information available to calculate the Inspection Average Rate, (but, the carrier does have at least one inspection), the IV score is simply the relatively high IV score of 92. The idea is to encourage additional inspections in order to obtain data on the carrier's safety performance.

If there is size information available for one Inspection type (Driver or Vehicle) but the associated Inspection quantity = 0 and there is no size information available for the other Inspection type (Vehicle or Driver), the IV score is simply the relatively high IV score of 92.

Thus, ALL carriers in MCMIS should have a SafeStat based IV score or an Insufficient Data based IV score.

#

CASE 2 (for weekly refresh)

For ease in weekly computation at the SAFER site, the following algorithm is used for the weekly refresh calculation. The results are essentially the same as the full ranking procedure.

Case 2: *For carriers with one or more previous roadside inspections, determine their Inspection per Power Unit Rate, their Inspection per Driver Rate, and subsequent Inspection Average Rate as follows and rank from 50-100.*

- ☞ The Inspection per Power Unit Rate is determined by dividing the number of Level I, II and V⁴ inspections the carrier has had in the previous 30 months by the number of power units⁵ they indicate.
- ☞ Similarly, the Inspection per Driver Rate is determined by dividing the number of Level I, II, and III⁶ inspections the carrier has had in the previous 30 months by the number of drivers⁷ they indicate.
- ☞ The Inspection Average Rate is then the average of these two rates (the Inspection per Power Unit rate and the Inspection per Driver rate). *If one of the rates can't be determined (because of no power unit or driver information or the associated Inspection Quantity is 0), the Inspection Average rate is simply the rate which can be determined.*
 - ✓ If there is no size information available to calculate the Inspection Average Rate, (but, the carrier does have at least one inspection), the IV score is simply "92".
 - ✓ If there is size information available for one Inspection type (Driver or Vehicle) but the associated Inspection quantity = 0 and there is no size information available for the other Inspection type (Vehicle or Driver), the IV score is simply "92".

For all other carriers that did not receive a score from the Safety algorithm but have at least one inspection (Driver or Vehicle) and an Inspection Average Rate greater than 0, assign IV scores based on Inspection Average Rates (A) as follows:

4 SAFER uses MCMIS data element WORK-VEHICLE-INSP-30-MTHS (SAFER db element VEHICLE_INSPECTIONS_LAST30)

5 SAFER uses MCMIS data element WORK-QTY-POW-UNIT (SAFER db element QUANTITY_POWER_UNITS)

6 SAFER uses MCMIS data element WORK-DRIVER-INSP-30-MTHS (SAFER db element DRIVER_INSPECTIONS_LAST30)

7 SAFER uses MCMIS data element WORK-QTY-DRVS (SAFER db element QUANTITY_DRIVERS)

Inspection Average Rate (A)	IV Score
$A \leq 0.25$	100
$0.25 < A \leq 0.45$	95
$0.45 < A \leq 0.625$	90
$0.625 < A \leq 0.9$	85
$0.9 < A \leq 1.0$	75
$1.0 < A \leq 1.5$	65
$1.5 < A \leq 2.0$	60
$2.0 < A \leq 3.0$	55
$A > 3.0$	50

Thus, ALL carriers in MCMIS should have a SafeStat based IV score or an Insufficient Data IV score.

#

SOURCE:

JHUAPL

File: Insufficient Data ISS2 4.doc, 2/16/2000